

AMENDMENTS TO THE SPECIFICATION:

Please replace the paragraph beginning at page 1, line 8 with the following rewritten paragraph:

--A pre-coated steel sheet has been broadly used in various fields such as a surfacing member for electric home appliance or an air conditioner and other goods, due to its good productivity compared with a steel sheet, which is formed to an objective shape ~~in~~ prior to application of paint.--

Please replace the paragraph beginning at page 1, line 12 with the following rewritten paragraph:

--The pre-coated steel sheet is manufactured by applying synthetic resin paint to both surfaces or one surface (which will be an external surface of a product) of a steel sheet, and baking the applied paint to form a paint layer. A corrosion inhibitor is commonly added to the resin paint in order to improve corrosion resistance of the paint layer. Adhesiveness of the paint layer is enhanced by chemically converting the surface of a steel sheet to a chromated or phosphated state ~~in~~ prior to paint application. The chemically converted surface layer also ~~affects effects on~~ improvement of corrosion resistance.--

Please replace the paragraph beginning at page 1, line 28 and ending at page 2, line 6 with the following rewritten paragraph:

--Chromium compounds or pigments based on chromium compounds, e.g. zinc chromate, strontium chromate, red chromate and red silicochromate, have been used so far as a corrosion inhibitor, due to excellent corrosion-inhibiting faculty. However, there is a stronger demand in these days for provision of a steel sheet coated with a paint layer free from chromium compounds, which exert ~~accounting~~ harmful influences on the environment. In order to cope with such the demand, a corrosion inhibitor prepared from porous silica particles, to which Ca, Zn, Co, Pb, Sr or Ba ion is bonded by ion-exchange, is proposed instead of chromium compounds.--

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Amendment After Allowance dated 12/17/2004
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Please replace the paragraph beginning at page 2, line 7 with the following rewritten paragraph:

--The proposed corrosion inhibitor captures corrosive ions such as hydrogen ion and discharges the bonded ion in return. Especially, Ca ion-bonded corrosion inhibitor performs good corrosion-inhibiting faculty. Such the corrosion inhibitor is ordinarily added to paint at a ratio of 2-50 parts by weight based on 100 parts by weight of resinous components in a paint layer. However, the Ca ion-bonded corrosion inhibitor is somewhat insufficient of corrosion and moisture resistance in comparison with chromium compounds, so that blisters often occur in a paint layer in a wet atmosphere.--

Please replace the paragraph beginning at page 3, line 15 with the following rewritten paragraph:

--The inventors have researched the reason why the corrosion inhibitor A does not exhibit good ~~well~~ corrosion inhibiting faculty as compared with a conventional corrosion inhibitor based on chromium compounds especially in a wet atmosphere, and discovered that an effect of Ca ion bonded to silica particles is not maintained over a long term since Ca ion is easy to dissolve in water permeated into a paint layer.--

Please replace the paragraph beginning at page 3, line 21 with the following rewritten paragraph:

--The corrosion inhibitor A could be improved in moisture resistance by coating silica particles with hydrophobic films such as a silane coupling agent or silicone oil in order to suppress dissolution of Ca ion. However, such the hydrophobic coating closes pores of the silica particles and scarcely permits dissolution of Ca ion, resulting in degradation of corrosion resistance. The inventors have researched and examined various means to suppress dissolution of Ca ion, and hit upon addition of a polyphosphate to paint.--

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Please replace the paragraph beginning at page 4, line 7 with the following rewritten paragraph:

--Addition of the polyphosphate B at the controlled ratio ensures continuous dissolution of Ca ion over a long term without degradation of the corrosion inhibitor A. Excessive addition of the polyphosphate B unfavorably suppresses dissolution of Ca ion, while shortage of the polyphosphate B causes occurrence of blisters in a paint layer due to poor moisture resistance. The A+B ratio in the range of 5-150 parts by weight is also important to form a paint layer with good of corrosion resistance, adhesiveness and workability.--

Please replace the paragraph beginning at page 4, line 20 with the following rewritten paragraph:

--There are no restrictions on a kind of resin paint[[,]] to which the corrosion inhibitor A and the polyphosphate B are added, but ordinarily based on polyester, macromolecular polyester, epoxy, epoxy-denatured polyester, epoxy-denatured macromolecular polyester or polyether sulfonate. Molecular weight, glass transition temperature and cross-link density of the resin paint are properly adjusted together with ratios of a curing agent and other pigments, when taking into account the ~~accounting~~ use of a painted steel sheet. For instance, a paint layer with good of workability is obtained from resin paint, whose glass transition temperature is adjusted at a level of 40°C or lower to increase elongation at a higher ratio above 50%--

Please replace the paragraph beginning at page 4, line 30 and ending at page 5, line 7 with the following rewritten paragraph:

--The resin paint may be applied as a single coat on a metal sheet or as an undercoat which will be further coated with a topcoat. A single coat is preferably of 3-20μm in thickness, while an undercoat is preferably of 1-15μm in thickness. Of course, an intercoat may be formed between the undercoat and the topcoat, as occasion ~~ecessation~~ demands. If intermediate or topcoat paint contains the corrosion inhibitor A, the polyphosphate B is preferably added to the paint in order to maintain the effect of the corrosion inhibitor A over a long term.--

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Please replace the paragraph beginning at page 5, line 8 with the following rewritten paragraph:

--A base metal sheet, to which the resin paint is applied, is preferably a steel sheet coated with a Zn, alloyed Zn, Zn-5%Al alloy or Zn-55%Al alloy layer due to good corrosion resistance. Such a steel sheet is favorably chemically processed ~~in~~ prior to paint application, so as to improve adhesiveness of paint layer(s) and corrosion resistance.--

Please replace the paragraph beginning at page 5, line 13 with the following rewritten paragraph:

--Chemical processing is typically chromating ~~ehormating~~. But, other Cr-free processing so as to form a phosphate, silicate, zirconate, manganate or titanate film on a surface of a base metal sheet is adoptable instead of chromating, in order to inhibit dissolution of even a tiny amount of chromium ~~ehromium~~ compounds.--

Please replace the paragraph beginning at page 5, line 18 with the following rewritten paragraph:

--Among the Cr-free processings, fluoriding realizes most effective results on corrosion resistance of a painted steel sheet. When a surface of the base metal sheet is chemically converted to a fluorided state at a ratio of 0.5-500mg/m² calculated as deposited fluorine and/or at a ratio of 0.1-500mg/m² calculated as deposited metals in total, a paint film formed thereon is remarkably improved in corrosion resistance. Such ~~the~~ fluorided surface layer is formed by treating the surface of the base metal with a chemical agent containing one or more of fluoroacids. One or more of H₂TiF₆, H₂ZrF₆, H₂SiF₆, H₂GeF₆, H₂SnF₆ and HBF₄ are suitable for the purpose. Especially, H₂TiF₆ exhibits best corrosion-inhibiting faculty.--

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Please replace the paragraph beginning at page 5, line 28 and ending at page 6, line 12 with the following rewritten paragraph:

--The fluorided surface layer is a corrosion-resistant coat composed of fluorine and metals such as Ti decomposed from fluoroacids, which are deposited on a surface of a metal sheet activated by fluoroacids dissolved in water. Metal components originated in the fluoroacid are reacted with hydroxyl groups of resin primer and also reacted with phosphoric acid discharged from the polyphosphate B in the undercoat. The surface layer of the metal sheet, which as been activated by etching, is reacted with Ca ion supplied from the corrosion inhibitor A in the undercoat, so bonding reaction of resin paint to the surface is accelerated. Consequently, the undercoat is firmly fixed to the surface of the base metal sheet, and a corrosion-resistant layer is generated at the boundary between the base metal sheet and the undercoat. Fluoric ion is also reacted with Ca ion supplied from the corrosion inhibitor A in the undercoat and converted to a stable compound such as calcium fluoride. The stable compound serves as a barrier and further ~~futher~~ strengthens the fluorided surface layer.--

Please replace the paragraph beginning at page 7, line 4 with the following rewritten paragraph:

--Various resin paint such as polyester, urethane, vinyl chloride, acrylic, polyether sulfonate, silicone or fluoric resin may be used for formation of a topcoat without any special restrictions. A kind, molecular weight, glass transition temperature and pigmentary dosage of topcoat resin paint are properly adjusted in response to use of a painted metal sheet as an interior member, cladding, etc.[[.]] PTFE (polytetrafluoroethylene ~~polytetrafuluoroethylene~~) may be added to the topcoat paint. An intercoat may be optionally formed on an undercoat ~~in~~ prior to application of topcoat paint, by 3-coat process. Of course, the painted metal having a single coat can be manufactured by 1-coat process. Paint applied to a base metal sheet is ordinarily baked by hot air in a continuous coating line.--

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Please replace the paragraph beginning at page 7, line 23, with the following rewritten paragraph:

--Thereafter, epoxy-denatured macromolecular polyester resin paint was applied to each steel sheet and baked 40 seconds at a maximum temperature ~~temperature~~ of 215°C to form a paint layer of 10µm in dry thickness.--

Please replace the paragraph beginning at page 13, line 2, with the following rewritten paragraph:

--After the same steel sheets as in Example 1 were chemically pretreated in the same way, epoxy-denatured macromolecular ~~maeromorecular~~ polyester primer paint was applied to each steel sheet and then baked 30 seconds at a maximum temperature of 215°C to form an undercoat of 5µm in dry thickness. Thereafter, macromolecular polyester topcoat paint was applied to the steel sheet and baked 40 seconds ~~40seconds~~ at a maximum temperature of 230°C to form a topcoat film of 15µm in dry thickness.--

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Please replace Table 8 (page 18) in its entirety with the following rewritten table:

Table 8: COMPOSITIONS OF CHEMICAL AGENTS FOR PRE-TREATMENT OF BASE STEEL SHEETS

	inventive examples								comparative examples				
Agent No.	1	2	3	4	5	6	7	8	9	10	11	12	13
fluorotitanate	65.20				48.60	50.40	0.78						
Fluorozirconate		35.20						5.59					
Fluorosilicate			35.20										
<u>Fluorosilicate</u>													
Fluoroborate				35.20									
deionized water	920.50	920.50	920.50	920.50	826.70	869.40	998.00	760.74	920.5	826.70	869.40	998.00	760.74
colloidal silica	5.90	5.90	5.90	5.90		5.00			5.90		5.00		
vaporized silica	3.90												
zirconium hydroxide	4.50	10.50	10.50	10.50					10.50				
zirconium carbonate					10.00	15.00				10.00	15.00		
molybdenum hydroxide								113.20					113.20
manganese oxide					20.00					20.00			
hydrogen fluoride							0.10						
phosphoric acid					34.50		0.67	106.30		34.50		0.67	106.30
tannic acid	5.00												
Starch								14.17					14.17
polyvinyl alcohol	5.00												
aminomethylated		27.90	27.90	27.90	61.20	61.20	0.45		27.90	61.20	61.20	0.45	
polyvinyl phenol													

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Please replace Table 9 (page 19) in its entirety with the following rewritten table:

Table 9: DEPOSITION RATIOS (by mg/m²) IN RESPONSE TO
 KINDS OF CHEMICAL AGENTS

Inventive Examples	Agent No.	1	2	3	4	5	6	7	8
	fluorides	40.9	17.0	31.1	32.6	39.1	34.7	0.6	2.9
	metals	35.8	28.5	16.2	13.9	19.5	23.2	0.3	2.6
Comparative Examples	Agent No.	9	10	11	12	13			
	fluorides	0	0	0	5.8	0			
	metals	10.5	5.3	12.6	0	0			

A ratio of metals means a total ratio of Ti, Zr, Hf, Si, Ge, Sn and B deposited on a surface of a base steel sheet

Please replace Table 11 (page 21) in its entirety with the following rewritten table:

Table 11: PREPARATION OF STEEL SHEETS FOR PAINT APPLICATION
 (COMPARATIVE EXAMPLES)

No.	a coated-base steel sheet		a fluoride coat eiat	
	a plating layer	an adhesion ratio (g/m ²)	a chemical agent No.	an adhesion ratio (g/m ²)
1	Zn	45	1	50
2	Zn	45	1	50
3	Zn	45	1	1
.	-	--	-	--

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Please replace the paragraph beginning at page 21, line 6 with the following rewritten paragraph:

--The first group of painted steel sheets are coated with undercoats of 5 μ m in dry thickness and topcoats of 15 μ m in dry thickness. Primer paints based on a thermosetting epoxy-denatured macromolecular polyester were applied to the surface of the steel sheet and baked at a maximum temperature of 215°C, while macromolecular polyester topcoat paints were applied to the undercoats and baked 40 seconds ~~40seconds~~ at a maximum temperature of 230°C.--

Please replace the paragraph beginning at page 27, line 1 with the following rewritten paragraph:

--It is noted from Table 15 that paint layers formed on steel sheets as comparative examples had disadvantages on at least one or more of boiling water resistance, corrosion resistance and moisture resistance. On the other hand, paint layers (shown in Table 14) formed on steel sheets as inventive examples were superior to any of boiling water resistance, corrosion resistance and moisture resistance. The comparison proves that painted steel sheets according to the present invention are excellent in all of boiling water resistance, corrosion resistance and moisture resistance without inclusion of chromium compounds.--